

Claims

[1] A transparent conductive film comprising laminated transparent conductive thin films of at least two layers, wherein a transparent conductive thin film of an uppermost layer is an amorphous oxide thin film composed of gallium, indium, and oxygen, a gallium content ranges from 49.1 atom % to 65 atom % with respect to all metallic atoms, a work function is 5.1 eV or more, and a surface resistance is $100 \Omega / \square$ or less.

[2] A transparent conductive film comprising laminated transparent conductive thin films of at least two layers wherein a transparent conductive thin film of an uppermost layer is an amorphous oxide thin film composed of gallium, indium, and oxygen, a gallium content ranges from 49.1 atom % to 65 atom % with respect to all metallic atoms, a work function is 5.1 eV or more, and a surface resistance is $50 \Omega / \square$ or less.

[3] A transparent conductive film according to claim 1 or 2, wherein a transparent conductive thin film other than the transparent conductive thin film of the uppermost layer includes at least one of an amorphous oxide thin film composed of indium, tin, and oxygen; an amorphous oxide thin film composed of indium, zinc, and oxygen; an amorphous oxide thin film composed of indium, tungsten, and oxygen; and an amorphous oxide thin film composed of indium, tungsten, zinc, and oxygen.

[4] A transparent conductive film according to any one of claims 1-3, wherein a thickness of the transparent conductive thin film of the uppermost layer is 5 nm or more and a total film thickness of the transparent conductive film is 300 nm or less.

[5] A transparent conductive film according to any one of claims 1-4, wherein an arithmetic mean height of a surface of the transparent conductive thin film of the uppermost layer is 2.0 nm or less.

[6] A transparent conductive base material comprising:

a transparent substrate; and

a transparent conductive film according to any one of claims 1-5, formed on one or both surfaces of the transparent substrate,

the transparent substrate being one of a glass plate, a quartz plate, a resin plate or a resin

film whose one or both surfaces are coated with gas barrier films, and a resin plate or a resin film into which the gas barrier film is inserted.

[7] A transparent conductive base material according to claim 6, wherein the gas barrier film is at least one selected from among a silicon oxide film, a silicon oxide-nitride film, a magnesium aluminate film, a tin oxide-based film, and a diamond-like carbon film.

[8] A transparent conductive base material according to claim 6, wherein the resin plate or the resin film is formed of polyethylene terephthalate, polyether sulfone, polyarylate, or polycarbonate, or has a lamination structure in which a surface of the resin plate or the resin film is coated with acrylic-based organic matter.